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DIRECTORATE OF PLANT PROTECTION, QUARANTINE & STORAGE
MINISTRY OF FOOD AND AGRICULTURE, GOVERNMENT OF INDIA

PLANT PROTECTION BULLETIN

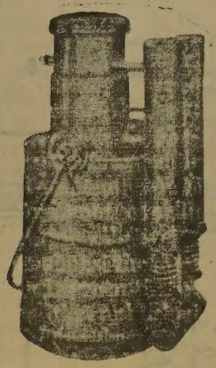
SCIENCE IN PRACTICE

Calocoris angustatus Leth. (A pest of *Jowar* and Maize)

ISSUED BY THE PLANT PROTECTION ADVISER TO THE GOVERNMENT OF INDIA
NEW DELHI
Price : Re. 1/-/- or 1sh. 6d.

BIRD-SCARING APPARATUS

An automatic machine for scaring away birds which is equally effective against rodents, rabbits and other ravagers of orchard and field crops, has recently been developed. It produces deafening reports at irregular intervals of from 20 to 40 seconds. The operational costs are low and it is not dangerous to handle. The working of the machine is based on the fact that the action of water on calcium carbide, produces a gas which when mixed with air, causes an explosion on ignition.



Carbide consumption is 2-3 lbs. per 12 hours of continuous operation. Cleaning and refilling is straightforward.

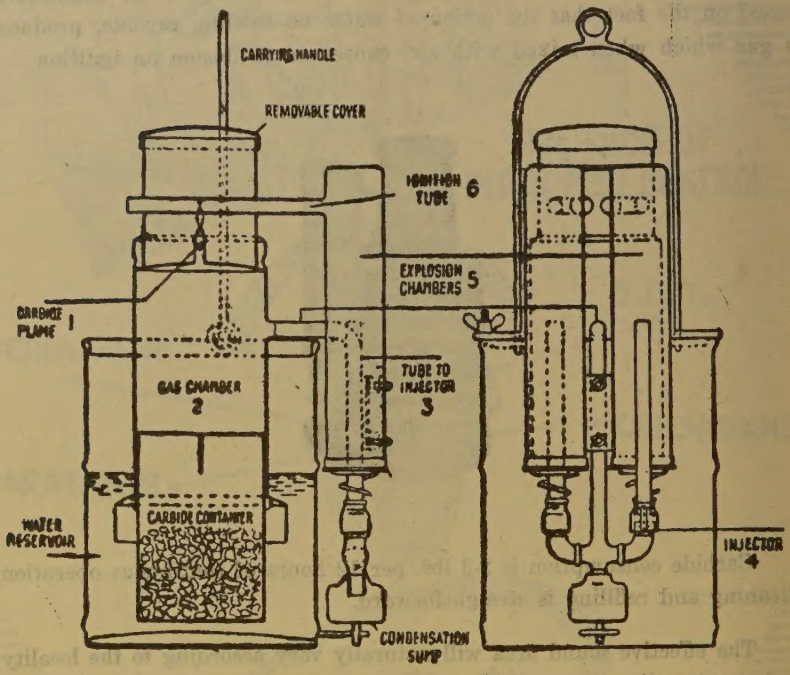
The effective sound area will naturally vary according to the locality and to the climatic conditions—for instance, a strong wind will carry the sound unevenly to one side of the machine. In an orchard, under normal conditions, the effective sound radius will be at least 50-60 yards, putting an area of from 10,000 to 15,000 square yards under the effect of the detonation.

In open fields protection will be given to much larger area—a sound radius of at least 100 yards, with an area of some 40,000 square yards covered, can be expected.

It is recommended that the machine is not placed on the ground but is hung up in order to avoid any disturbance in the working of the

machine as a result of the explosions. In fact, if it is practicable, an ideal position for maximum results in an orchard is about 6 feet above the top of one of the highest trees.

The "LOOSCO" Bird Scarer



Brief mechanical description.—The apparatus is a small automatic acetylene generator. A carbide burner is continuously burning with a small flame. (1) From the gas chamber (2) a tube (3) leads to the injector (4) where the acetylene is mixed with air forming an explosive gas. This explosive gas mixture is conducted to the explosion chambers (5) at the top of these explosion chambers is the ignition tube (6) which runs close to the flame.

Whenever a quantity of gas of the required mixture has accumulated it will be ignited by the flame and the gas will explode with a deafening bang. As there are two explosion chambers—quite independent of each other—the detonations occur at irregular intervals.

A NOTE ON THE DECCAN GRASSHOPPER (*COLEMANIA SPHENARIOIDES* BOLIVAR) AND ITS CONTROL

By

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The Deccan grasshopper is one of the worst scourges of dry crops in parts of the Ceded districts in the Madras State. It is known as " Jitti " in Kanarese and " Midatha ", " Gopulu " etc., in Telugu. A common feature in most of the species belonging to the category of grasshoppers, is that the young ones do not have their wings and that these are developed later as the nymphs moult into adults. There are, however, a few exceptions to this rule, as in the case of the pest under discussion and a few other species allied to it. As regards the Deccan grasshopper, only the upper pair of wings is present in a rudimentary form even in the adults, while the lower pair is not at all developed. The adults as well as the nymphs are, therefore, not capable of flying but can jump about actively with the help of their well-developed hind pair of legs. The pest is, therefore, popularly known as the Deccan wingless grasshopper. The imagines are vivid blue and green in colour, with a longitudinal red band along the back. From the published and unpublished records available, the pest appears to have been originally rampant in parts of the Bombay State and invaded the adjoining tracts of Mysore, Hyderabad and Madras subsequently. In the Madras State, its ravages have been restricted to parts of Bellary. Kurnool and Ananthapur Districts. The first outbreak was recorded by 1908 and this continued in a virulent form till about 1916. There was a period of comparative lull for the next seven years, after which the pest again assumed destructive proportions by 1925 and persisted till about 1931. A recurrence was reported by 1947, the severity of which was protracted upto 1950. There is thus, enough evidence to show that the hoppers occur in definite cycles and that the damage by each cycle extends for a few years. The biology and control of this species have been investigated in detail in Mysore and Madras States long ago and the following is a short account of the work done so far and of the later developments in the solution of the problem.

Life history.—The life history and habits of this grasshopper have been worked out in detail by Coleman (1) under conditions prevalent in Mysore and later by Ramachandra Rao (3) in Madras. The grasshopper is one of the instances where the insect passes through only one brood in a year. The breeding season commences by September and may extend upto November-December. The female, after mating, thrusts her abdomen into the soil and lays the eggs loose in small groups at a depth of two to four inches. Each group may contain about 30-60 eggs

and a female may lay two to three such masses. The maximum individual capacity is somewhere about a hundred. The holes, which are drilled in the soil for the oviposition, are later plugged with a frothy exudation, probably to afford some protection to the eggs below. These eggs remain as such under the soil till the next South-West monsoon rains and the tiny nymphs hatch out with the receipt of the sowing rains by about the next July. They feed and grow on almost any vegetation—wild or cultivated—available nearby and undergo five to six moults in the course of three to four months. The adult stage is reached by about September and the life-cycle is thus repeated.

Nature and extent of damage.—Coleman(1) has recorded that the hopper population is more abundant in black soils and that the damage is, therefore, heavier in such areas than those under red soils. The probable reason for this may be that the black soils are friable and loose for the easy penetration of the abdomen for oviposition, whereas the red soils are definitely harder. It is probably on account of the requirement of such conditions that the oviposition is generally concentrated in the loose soil round about the base of the plants. Ramachandra Rao (3) states that the damage is equally virulent in both the red and black soils in Bellary. The experience has been similar to the other Departmental officers also who have subsequently investigated the pest from time to time. The hoppers feed on most of the dry crops like Tenai (*Setaria italica*), Samai (*Panicum miliar*), Ragi (*Eleusine coracana*), Sorghum (*Andropogon sorghum*), Green gram (*Phaseolus mungo*), Black gram (*Phaseolus mungo, var radiatus*), lab-lab (*Dolichos lab-lab*), Red gram (*Cajanus cajan*), Cumbu (*Pennisetum typhoides*), Groundnut (*Arachis hypogoea*) and occasionally on chillies (*Capsicum* sp). In spite of the fairly wide array of host plants, the pest has been found to be more partial to the cereals. Most of the crops being sown at the time of the emergence of the nymphs, the latter first feed on the grasses and weeds growing on the waste lands nearby and take to the cultivated crops as they grow. The leaves, especially of the cereals, are first eaten to shreds but the more serious phase begins when the plants put forth their flowers. The hoppers which are fairly grown up at this stage, congregate on the flower heads and eat away the florets, practically reducing them to mere stalks bearing a few grains. The damage wrought is often disastrous, and it is reported to range from 25 per cent upto an utter ruin of the produce.

Natural enemies.—Coleman (1) has recorded the following natural enemies of this grasshopper. Birds like the pariah kite (*Milvus migrans* Boddaert), the house crow (*Corvus splendens* Vieillot), the white scavenger vulture (*Neophron ginginianus* Latham) the southern grackle (*Eulabes religiosa* Linnaeus), the cattle egret (*Bibulucus coromandus* Boddaert) and the common myna (*Acridotheres tristis* Linnaeus) have been recorded to feed on the grasshoppers in all their stages. The lizard (*Sitana ponticeriana* Cuvier) often devours the eggs. An unidentified robber fly (Asilid) has been found to prey on the nymphs. Maggots of the Bombylid (*Systaechus nivalis* Brunetti) and the larva of the Cantharid

beetle (*Mylabris pustulata* Thomson) are predatory, on the egg masses. Despite the fact that the pest has such a large number of natural enemies, even the cumulative effect of their activities has at no time, been found to cause any perceptible reduction in the population of the hoppers.

Control methods.—The previous methods of control as attempted by Coleman (1) as early as 1911, pivot round mechanical and cultural measures first against the egg stage and later the larval or adult stages. Ploughing the land with a shallow country plough with the object of disturbing the soil and exposing the egg-masses to the weathering agencies and natural enemies, was first tried. Along with this, some of the badly infested fields were also ploughed with a deep plough with a view to bury the egg-masses at lower depths and study influence of this operation on the emergence of the nymphs. Extensive trials have been made by Coleman (1) and Ramachandra Rao (3) to destroy the nymphs by passing huge drag-nets over the infested crop. Appreciable numbers are reported to have been caught and disposed off by dumping the catches in kerosenated water. A thorough decimation of the population was not, however, feasible by the first operation and three to four of such baggings were, therefore, recommended. Kylasam (2) mentions about the attempts made to destroy the pest in its egg stage by raking up the soil with the H. M. Guntaka. Along with these, a crude model of a hopper dozer, was improvised and tried by Ramachandra Rao (3) by 1911. Its inner sides were painted with tar and the contraption was dragged over the lines of the crop. The nymphs which hopped about by the disturbance were caught in the adhesive surface and killed. Encouraged by these results, improved models fitted with wheels and using a mixture of rosin and castor oil, as the adhesive were designed later and tried during 1931 by Kylasam (2). From a review of the development in the methods of control during the successive years, it looks as if the results have, at best, been only partially successful. None of them had caused any spectacular reduction in the population. Further, the methods are so cumbersome and laborious, with the results often indifferent that very few of the ryots could be induced to interest themselves in the departmental advice.

Work Done.—The situation was left as it was till about 1948, when the problem was reinvestigated with the advent of the synthetic chemicals —BHC and DDT.

A severe outbreak over extensive areas was reported from Uravakonda, Ananthapur District, during November 1948. The locality was visited and dusting with BHC 5 per cent was tried for the first time in some of the worst affected fields. The results were not convincing against nymphs and much less against the adults. The experiments could not be pursued to conclusive ends since the active stage of the pest was over and the population itself was fast subsiding.

A set of more detailed experiments was laid out during 1949, the variants being dusts of Gammexane 10 per cent, 7 per cent and 5 per cent, Hexyclan 10 per cent and 5 per cent and DDT 3 per cent. The chemicals were applied only once with a rotary duster at 20 lb. per acre,

the standing infested crop being *Setaria* and Cotton. The size of the plots for each treatment was 20 cents, replicated four times. The comparative merits of the different formulations were assessed by recording the hopper population before and after dusting in each replication.

Results.—Gammexane 10 per cent and Hexyclan 10 per cent had a spectacular effect against the adults and nymphs. The percentage of reduction of the adult was over 85 and of the nymphs over 90 in the case of both the preparations. The 7 per cent formulation of Gammexane caused a reduction of 93 per cent of the nymphs but was feebler against the adults, the decrease being only 59.7 per cent. The efficacy was lower with the weaker concentrations. The mortality of the hoppers in the case of the 10 per cent dusts was fairly quick and thorough. Obvious signs of discomfort were exhibited within about an hour after contact, death itself occurring in about six hours.

Conclusion.—The results have indicated the specific action of Benzene hexachloride against the pest, the efficacy being proportionate to the concentration.

Commercial brands, with a guaranteed 10 per cent content of the insecticidal element, may be used against this grasshopper and the efficacy of the chemical has now passed the experimental stage.

About 20 to 25 lb. of the dust may be required to treat an acre and the cost may come up to Rs. 6|- or 7|-. The actual amount of loss averted may depend upon the severity of the infestation, which may range from 25 per cent up to a wholesale loss of the crop.

ACKNOWLEDGMENT

The author acknowledges the help of the Government Entomologist, Plant Protection Officer (Entomology) Bapatla, his staff and the District staff for the kind help and facilities extended by them.

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(1) Coleman L. C. 1911 — Department of Agriculture, Mysore State Entomological series, Bull. No. 2, pp. 43.

(2) Kylasam M. S. 1936 — Madras Agricultural Journal, Vol. XXIV No. 5, 1936, pp. 165.

(3) Ramachandra Rao Y. 1931 — Department of Agriculture, Madras Leaflet, No. 39.

IMPORTATION OF BEES AND SILKWORMS INTO INDIA

The following Notification of the Finance Department (Central Revenues) in respect of importation of Bees and Silkworms into India is given below for information of apiculturists and sericulturists :—

NOTIFICATION

Customs.

New Delhi, the 20th December 1941.

No. 69.—In exercise of the powers conferred by section 19 of the Sea Customs Act, 1878 (VIII of 1878), the Central Government is pleased to prohibit, with effect from the 1st April 1942, the bringing into British India of bees or silkworms save where they are accompanied by—

(a) a special permit in accordance with the form set forth in the Schedule hereto annexed authorising such importation issued by the Central Government or by an officer authorised by the Central Government in this behalf; and

(b) a certificate of freedom from disease granted by an Entomologist of the Government of the country of origin.

SCHEDULE

Form of special permit authorising importation of bees or silkworms.

1. Name, designation and full address of the importer.....
.....
2. Name of the species of bees or silkworms to be imported.....
.....
3. Stage or stages of the bees or silkworms to be imported.....
.....
4. Country from which importation is sought.....
5. Whether importation is intended by sea, land or air.....
6. Name, designation and address of the exporter.....
.....
.....
7. Quantity indented for.....
8. Purpose of importation.....

The above information is true to the best of my belief.

Date

(Signature of the importer).

I authorise the importation. This permit will be valid upto.....

Date

(Signature and designation of the certifying authority).

(*N.B.*—It is expected that the permit will be obtained in advance of sending the order so that the imported material may not remain indefinitely in the warehouse for want of suitable permit).

M. SLADE

Joint Secretary to the Govt. of India

No. 69|C. 429-Cus. II|41.

RECENT SPRAYING EXPERIENCE*

Reports of recent experience in crop spraying were given by plant protection delegates to the third International Congress of Crop Protection held in Paris last month.

Mr. E. Holmes spoke on the trend toward the use of gamma BHC and how its disadvantages were being overcome by the use of formulations of the pure gamma isomer and by the employment of newer techniques, which include particularly the use of insecticidal seed dressings containing such fungicides as the organo mercury and thiram compounds with gamma BHC.

Wire worm attacks on British sugar beet, said Mr. D. Price Jones, could be dealt with conveniently on land arable rotation by the use of gamma BHC as seed dressing preferably in conjunction with thiram and organo-Mercurial fungicides. This technique was adequate, with all normal seed-rates (say 10-20 kgs|ha) and very nearly adequate at much lower seed rates. With rubbed seeds used at 5-8 kgs|ha. a somewhat heavier application of gamma BHC might be necessary.

On ploughed up permanent grass land, the seed dressing method was not always satisfactory. Its effect could be enhanced by stepping up the seed rate to (say) not less than 20 kgs|ha for a mid-March sowing, decreasing to not less than 16 kgs|ha. for a mid-April sowing ; also by ensuring the best possible seed-bed. In many cases, however, a broadcast applications of BHC was preferable.

Gamma BHC phytotoxicity was aggravated by high seed rates and shallow sowing; also it was more marked on sandy soils or light peaty soils than on heavy soils and was worse at high temperature than at low temperature.

Aldrin and dieldrin had been singularly ineffective for wireworm control on sugar beet in Britain. said Mr. Jones. This was surprising in view of the fact that in the U.S.A., they compare favourably with gamma BHC in the protection afforded to corn (maize) against wireworms.

New foliage fungicides for the control of apple scab were described by Mr. I. M. Burnet. His paper gave results of field spraying experiments for control of apple scab, *Venturia inaequalis* (Cooke) Wint. chiefly with a 5 per cent phenyl mercury-acetate formulation used at 0.003 per cent Hg. Results obtained with ferbam, thiram, glyoxalidine, and dichloronaphthaquinone were also given.

Under orchard condition of severe scab in 1951, all the above gave disease control equal to or better than the standard lime sulphur. Phenyl mercury acetate preparation has been chosen for further development on account of availability and cost.

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*Extract from *Agricultural Machinery Journal,* VI(10) 1952, p. 58.

In a paper on weed control in grassland, Mr. H. P. Allen said that a serious problem on a large proportion of unploughable permanent pasture was that of weeds, especially *Ranunculus* spp., *Cirsium arvense, Juncus spp., Senecio jacobaea. Rumex* spp. and *Equisetum.*

He gave details of a large series of simple trials in which MCPA sodium salt was used against *Ranunculus* spp., *Cirsium arvense, Juncus communis* and *Senecio jacobaea* at a standard rate of 1.6 kg. per hactare of water applied by low-volume spraying machine. *Ranunculus repens* and *R. acris* were easily suppressed by MCPA at this rate, and the effect had persisted so far for two grazing seasons. Good results had been obtained with MCPA against *C. arvense* with the above rate of MCPA sodium salt applied when the buds of the weed were just about to open ; re-treatment in the following season might be necessary, but this depended on the extent of re-growth of *Cirsium.*

Senecio jacobaea required treatment with MCPA in summer or autumn for two successive seasons. *J. communis* was suppressed by MCPA, quickest results being obtained if the weed was cut before spraying.

Trifolium repens might be retarded by a single application of MCPA sodium salt at the above mentioned rate, but given good management, it should recover by the following season.

Comparative experiments with derivatives of MCPA and 2, 4-D were described. MCPA was superior to 2, 4-D on *Ranunculus* spp. and *C. arvense.* MCPA and 2, 4-D were harmless to stock, but where *Senecio jacobaea* was concerned special precautions were advised.

TOXICOLOGY AND HAZARDS OF THE NEWER PESTICIDES

Dr. George C. Decker, Head of the Economic Entomology Section of the Illinois Natural History Survey and Illinois Agricultural Experiment Station, Urbana, Illinois, giving testimony before the Delaney Committee, Washington, D.C. on May 2, 1951, said as follows :—

" Most pesticides have some toxic properties. If they did not have these properties they undoubtedly would not control pests and therefore would not be pesticides. " Toxicity " and " hazard " obviously are not synonymous terms. Toxicity is the capacity of a substance to produce injury ; hazard is the probability that injury will result from the use of the substance in the quantity and in the manner proposed.

In evaluating the hazards involved in the use of pesticides, one must distinguish between the use or operational hazards, which might affect employees of the manufacturer, processor, or user ; and the food contamination hazards, which might affect the consumer of the end product.

In general, use hazards are related to acute toxicity and may be measured in terms of the relative toxicity of the pesticides and the degree of exposure to it. The user should be fully informed through proper labelling and instruction as to the hazards involved. He should then be at liberty to make a free choice from the materials available and assume full responsibility for his actions. All accidents are deplorable and every reasonable effort should be made to reduce operational hazards to a minimum. However, it should be recognized that farm accidents involving the use of pesticides and other chemical tools are insignificant when compared with farm accidents involving the use of mechanical tools. In my home state, Illinois, there are over 1,000 occupational farm accidents annually. Approximately 200 of these involve fatalities and 300 or more involve amputations or other permanent injuries, but practically none are chargeable to the use of pesticidal chemical. If we can believe the record, there is greater danger that a farmer will be killed or permanently disabled by falling from a spray rig than there is that he will be seriously injured by the poisonous chemicals he puts into the sprays out of the spray tank.

Food hazards are, in general, closely related to the chronic toxicity of the pesticidal chemical involved and may not be measured in terms of the chronic toxicity of the chemical and the amount of residue remaining on or in food reaching the consumer.

The inherent toxicity of a pesticide or pesticidal chemical to warm-blooded animals may have little or no direct bearing on the final food hazard. In many cases the more toxic materials such as parathion, lindane and aldrin, are applied at times when the edible portion of the crop is not exposed. As a rule, such chemicals are applied in proportionately smaller amounts than are less toxic materials and frequently the more

toxic compounds are short-lived. In other words, they are quickly destroyed through chemical change or lost through decomposition or evaporation. It would not, therefore, be in the public interest to deny entomologists and agriculturists access to valuable pesticides strictly on the basis of their inherent toxicity to warm-blooded animals. Fruit and vegetable growers should not be denied the right to use a pesticidal chemical no matter how poisonous, provided its use as recommended does not endanger the public health."

According to Dr. Frank Princi of the Kettering Laboratories, University of Cincinnati,—" The very adjectives ' toxic ' and ' non-toxic ' are used so carelessly as to produce unnecessary concern or a false sense of security. It is axiomatic that no substance is entirely harmless or completely unsafe in any concentration and under all circumstances. For example, the ingestion of sugar is dangerous for the diabetic, common salt must be removed from the diet of the cardiac patient and yet even strychnine may be used with safe therapeutic effect when the dose is small. Therefore, it would seem to be more realistic to consider materials from the point of view of their pharmacologic action in the negative sense only, and from the point of view of physiologically harmless dosages in the positive sense. Thus a substance can be regarded as toxic from the former point of view and yet relatively inocuous for normal use."

Dr. Edward F. Knipling of the Bureau of Entomology and Plant Quarantine U. S. Department of Agriculture in his Presidential address to the American Association of Economic Entomologists at its 64th Annual Meeting held in Philadelphia, December 15, 1952 said " Modern insecticides have a fine safety record of use both in the home and in agriculture, and have saved millions of people from death or illness. DDT alone is credited with saving an estimated 5,000,000 lives and preventing at least 100 million illnesses. " I am convinced," he said, " that to-day we have safer insecticides for controlling insects in home than we had ten years ago. We have synthesized pyrethrum, allethrin, and methoxychlor insecticides low in their toxicity to man and animals. The record of extensive and safe use for DDT, chlordane, and lindane is good. These newer insecticides have replaced almost completely the more toxic insecticides such as the arsenicals, fluorides, thallium, phosphorus and cyanide, which formerly were commonly used in homes for controlling household pests and disease carriers."

" Alarmists are telling the American people that insecticides are the greater danger. They claim that we are being poisoned by the new chemicals."

" I have come to the conclusion that such fears for the most part result from a misinterpretation of laboratory toxicity data in terms of insecticide hazards to man. Data obtained in experiments on laboratory animals do not give us a true measure of the insecticide's hazard to man, and should not be used as reason for sounding the alarm. How the insecticide is used to control insects largely determines its toxicity hazard."

Insecticides Properly Investigated for Toxicity

" We, as entomologists, must not underestimate our responsibility to the public in seeing that insecticides are used safely. I am convinced and our record supports this conviction—that we have not neglected the responsibility of demanding adequate information about the toxicity of insecticides before making recommendations for their use.

On the other hand, I wonder if the general public is fully aware of our parallel responsibility of helping to adequately feed and clothe people by controlling the pests that destroy agricultural products.

When we consider our insecticides as man-savers rather than as man-killers, it calls for an entirely different outlook on the matter of calculated risks in employing insect control chemicals.

In the field of medically important insects, we are constantly faced with this decision. Is it better to recommend using a chemical having a calculated health risk or to deny people the protection this chemical can give them against a disease carrier ?"

Unprecedented Usefulness of Insecticides

" We have faced and answered this question ourselves many times during the past 10 years—a decade that has witnessed not only the development of most of our new insect killers, but also World War II and the Korean conflict. All previous wars have caused great increases in the incidences of insect-borne diseases. During this decade unprecedented and highly successful use of insecticides has been made to protect our fighting men and the citizens of our own and allied countries from malaria, louse, and mite-borne typhus, and many other disease organisms transmitted by insects, ticks, and mites.

DDT has come under heavy fire from those who believe that this insecticide for some purposes at least, constitutes too great a health risk to permit its use in the manner now advocated for controlling insects which affects man. This attack goes on despite DDT's fine record in protecting people throughout the world from disease-carrying insects. How many illnesses—how many deaths—would you say that the use of DDT has prevented ? On the basis of discussions with several authorities on insect-borne diseases I estimate that no less than 5 million lives have been saved; no less than 100 million illnesses have been prevented through the use of DDT* for controlling malaria, typhus, dysentery and many other diseases since it became available about 1942.

To my knowledge not one death (excluding accidental deaths) or serious illness has been caused among the people exposed to the insecticides in connection with the control of insects."

Common Chemicals More Lethal than DDT

"We can expect almost any insecticide to cause death under conditions of gross carelessness or when people make suicidal attempts. However, reported cases of accidental deaths due to DDT in my opinion have been few in number in spite of the extensive handling and use of these insecticides. According to Simmons and Hayes (Soap and Sanitary Chemicals, December 1951), 14 deaths have been listed as resulting from DDT, but they indicate that in most cases the solvents played an important if not deciding role.

What is the record for other common chemicals? Vital statistics published by the Federal Security Agency for one year, 1949, show that aspirin was responsible for 70 accidental deaths, lye and similar chemicals for 87, kerosene and other petroleum products for 117, and barbituric acid and derivatives for 466.

As entomologists, we may well be proud of our achievements in improving the health and living standards of our fellow men through insect control. But let us remember that these achievements would not have been possible without the contributions of chemists and toxicologists. Further progress in developing effective and safe insect control chemicals will require even more help from these specialists. The rapidity of future progress will depend in large measure on how well the research of entomologists, chemists, and toxicologists is coordinated*."

*Extract from Agricultural News Letter, Vol. 21, No. 2, March-April, 1953, pp. 17—20.

RESOLUTIONS OF THE IRAN DESERT LOCUST CONFERENCE OF OCTOBER, 1952

After hearing the reports and discussions of the various delegates it become evident that the situation of the desert locust at present is very grave. Swarms which escaped destruction are already active in India, Pakistan, South-Arabia and Africa.

The Conference therefore makes the following recommendations :

1. Every possible effort should be put forth by the countries involved to meet this serious situation.

2. Countries liable to invasion by the desert locust should make all advance preparations possible.

3. Work of locust control should in no way detract defining and surveying potential outbreak centres.

4. Having noted the outstanding results achieved through International Cooperation in different countries especially during this year the Conference recommends that this cooperation should be continued and strengthened.

5. It is recommended to all countries concerned to replace as much as possible old methods with new chemical mechanized means which are more effective and less expensive.

6. It is recommended that the forms adopted in Cairo and Rome Conferences to report locust movements and breeding should be followed by all countries.

7. Owing to the importance of the Arabian Peninsula with regard to locust proportion and invasion, the Conference asks FAO to increase assistance it renders to those countries and organizations working in the Arabian Peninsula, bringing about more effort and coordination.

8. In consideration of the Pakistan delegate's resolution on FAO stock piles this Conference recommends that FAO establish enough centres of distribution to serve the whole locust area.

9. The conference would like to express its appreciation for calling this meeting in Tehran and thank the Iranian Government, especially the Ministry of Agriculture for its hospitality.

CONCLUSIONS AND RECOMMENDATIONS OF SECOND MEETING OF FAO TECHNICAL ADVISORY COMMITTEE ON DESERT LOCUST CONTROL MEETING AT ROME FROM 3RD TO 6TH NOVEMBER 1952

Desert Locust Situation and Outlook

1. The Committee examined the recent developments in the desert locust situation since March 1952. Spring and early summer breeding took place in many countries of the Middle East, but, as a result of vigorous and internationally coordinated operations, no serious escapes occurred except in the Eastern Region.

2. The escaping swarms moved into Afghanistan, Pakistan and India, during the period June-August, resulting in very heavy and extensive monsoon breeding in the two latter countries. Despite most intensive campaigns, a certain number of swarms escaped, some of which have recently migrated westwards to reinvade Iran and eastern Arabia. This westward spread of immature swarms is still in progress.

3. In eastern Africa there was very intensive breeding from March to September in the Somali Peninsula. Control operations were handicapped by adverse weather and the opposition of nomadic tribes. These operations, although largely successful, did not prevent the development of a number of new swarms which are now migrating into Ethiopia, British East African Territories and south west Arabia. Breeding in these areas has commenced and control operations are in progress.

4. Except for these two main centres of infestation in the Eastern and Central Regions, the rest of the Desert Locust invasion area is free.

5. The Committee wished to emphasize that it has been amply demonstrated that, although a hopper infestation may be extremely severe and widespread, crop damage can be prevented if adequated control forces, employing modern methods, are fully mobilized and strategically deployed. The extensive campaigns during the first three quarters of 1952 achieved almost complete protection of crops, the only damage reported being caused in Pakistan by the westward migrating swarms in September-October. However, the resources for the campaigns in some countries were inadequate to prevent the plague becoming more widespread and more intensive.

6. The area of the most immediate strategic importance is eastern Africa, comprising the Somalilands, Ethiopia and British East Africa, as well as part of Arabia. Any swarms that may escape from the present breeding there are likely to spread further through East Afica and Ethiopia to invade Eitrea, the Sudan and Arabia.

7. It would thus appear that heavy breeding can be expected in Spring 1953, particularly in East Africa, across the Arabian Peninsula. in Iran and Western Pakistan, but, as in 1952, the invasion may extend to other Middle Eastern countries.

8. Should the spring breeding not be effectively controlled, it will reinforce the infestations of the Eastern and Central Regions and the plague will probably spread into the Western Region.

9. The Committee stressed that the desert locust threat for 1953 is far more grave than it was in the corresponding period in 1952, and, unless even greater efforts are made during the coming months, the position is expected to deteriorate and considerable damage to crops may result. Therefore, much greater and even better coordinated efforts in all Regions are required to meet the increasing danger.

Review of 1952 Control Operations

10. The Committee reviewed the control operations undertaken in the different countries and wished to put on record its recognition of the intensified operations undertaken by all affected countries and particularly wished to emphasize the unprecedented degree of international cooperations and mutual aid which was achieved during 1952.

11. The Committee wished to record its appreciation of the part played by the TCA Locust Control Program through its active contribution to the campaigns in a number of countries. The Committee recognised that, this direct assistance from the U. S. A. materially augmented the individual efforts of the countries concerned.

12. The Committee also wished to record its appreciation of the part played by FAO in coordinating and supplementing national efforts, thereby establishing its value as an international co-ordinating agency. The Committee considered in detail and approved the action taken by FAO to implement the recommendations of the First meeting of the Committee and wished to express its satisfaction with the manner in which FAO has approached its task. The Committee hoped that FAO would make further financial provision to continue these activities as long as the emergency lasts.

Control Techniques

13. The Committee considered recent developments in locust control techniques, especially the treatment of ovipositing swarms and egg fields with insecticides, the introduction of aldrin baits and the utilisation of aircraft for controlling locust swarms. The Committee particularly stressed the urgent need for developing techniques for destroying swarms in flight.

General

14. The Committee regretted that Iran was not represented at the meeting, particularly in view of the strategic importance of Iran at the present moment.

15. The Committee appreciated the action taken by FAO in calling the second meeting of Advisory Committee.

RECOMMENDATIONS

1. The Committee recommends that FAO should urge all those countries threatened by the desert locust which have not yet signed agreements with FAO and the U. S. A., to do so at an early date so that they may be able to avail themselves of the assistance offered, should the need arise.

2. Having discussed how the equipment and supplies held by FAO might best be used for the benefit of the overall plan, the Committee recommends their distribution according to the attached schedule. The Committee recognises that circumstances may arise to justify modifications by FAO, especially if the plague extends to other countries.

3. The Committee recommends that FAO should proceed with the purchase of further Dodge Power Wagons, to be placed in reserve at Karachi and Jedda, and stocks of 50 per cent BHC to be held at Karachi and Damascus.

4. The Committee considers that, in principle, countries procuring materials and equipment from FAO strategic reserves or other sources should normally be responsible for the transfer of such materials from and to the supply base.

5. The Committee recommends that FAO in its capacity as a co-ordinating agency, should take active steps to stimulate the Governments of such countries as Afghanistan, Saudi Arabia and Yemen to encourage and support locust control within their territories, with the hope that these countries may themselves be able to participate directly in the regional programme.

6. The Committee considered the need to encourage the active participation of Spanish territories in the Western Regional programme and requests FAO to bring this matter to the attention of the Spanish Government.

7. The Committee considered the adoption of standard report forms by all countries affected by the desert locust for recording locust swarms and hopper bands. The Committee approved the attached proformas, and requests FAO to urge their adoption by all countries.

8. The Committee recommends that F. A. O. should consider what steps it might take towards assisting the rapid evaluation of techniques suitable for the destruction of locust swarms in flight.

9. The Committee considered the question of processing the mass of unpublished meteorological data available from Ethiopia and territories in the Somali Peninsula held by Professor Fantoli in Rome. The Committee emphasises the importance of this data for the study of the desert locust and requests FAO to explore how this project be undertaken and financed, possibly through the World Meteorological Organisation.

10. The Committee called attention to the fact that when the present desert locust plague is brought under control, the urgent need to co-ordinate research and survey work will continue. The committee expresses its hope that FAO should act in a co-ordinating capacity for research and survey, as it is now doing for control and recommends that this question should be placed on the agenda of the next meeting of the Technical Advisory Committee.

11. The Committee recommends that the next meeting of the Technical Advisory Committee should be held in April 1953 at Rome.

PRELIMINARY OBSERVATIONS ON THE CONTROL OF LICHENS WITH WEED-KILLERS IN KUMAON

By

S. K. Bose and L. N. Agarwal

Introduction

Lichens abound on the temperate fruit trees of Kumaon. The infestation usually becomes very heavy within four or five years. Trees heavily laden with lichens do not branch properly after pruning. The affected trees also become more susceptible to diseases of the stem and branches due to the more humid micro-climate induced by the lichens. The foliose type of lichens, specially species of *Evernia* and *Parmelia*, cause most of the damage due to their covering nature. Earlier investigations in Kumaon have shown the effectiveness of caustic soda (0.5—1.5 per cent) in controlling the lichens. This was found to be far superior to solutions of copper compounds. However, the corrosive action of caustic soda on the operators and the equipments, is a definite drawback. During the year 1952, certain weed-killers were tried against various types of lichens at the Government Gardens, Chaubattia.

Treatments

Agroxone—0.4 per cent, 0.2 per cent, 0.1 per cent.

Fernoxone—as in Agroxone.

Dicotox—200, 100, and 50 cc. respectively in 5000 cc. of water.

The spraying was carried out during the month of August, on lichen-infested apple trees prior to defoliation.

Phytotoxicity

It was found that Dicotox was injurious to the foliage of the apple trees in all concentrations tried. Higher doses of Agroxone induced slight injury. No visible injury was found to be caused by the various concentrations of Fernoxone. The affected leaves were not examined histologically but the visual nature of injury was that of scorching.

Effect on Lichens

There was no immediate visual effect on the lichens after spraying with the various weed killers. However, some species of *Parmelia* exhibited intensification of green colour. After two months the effect on the lichens was again examined in the orchard. The visual changes were pronounced. *Evernia* and *Usnea* spp. showed charring or reddish tinge, while *Parmelia* and other clinging foliose lichens showed marked intrease of the green colour. Visual effect was the greatest on species of *Evernia*, the next in order being species of *Parmelia*, while species of *Usnea* were least affected as far as the external appearance was concerned.

In general, marked visual symptoms were greatest in the case of Agroxone. Dicotox and Fernoxone were nearly equally effective, though Dicotox was slightly stronger.

Mode of Action of the Weed-Killers

The various types of lichens from the treated and the controlled trees were examined in the laboratory. In short, it may be stated that the weed-killers affect the algal cells within the lichens. In higher doses of the week-killers, the algal cells were found to be degenerated. In lower doses, the cells were found to be devoid of starch and dead. The algal components of species of **Usnea** and those of some erect lichens, were found to be more resistant especially in the lower doses.

Overall effect of the Weed-Killers

Although the visual effect was less in the lower doses, it was found that after 8 months most of the lichens on the treated trees were dead. The rhizines were rotten and the lichens were loosely attached to the substratum. Only species of *Usnea* and certain erect types were, in some cases, firmly attached.

Conclusion

Since the maximum damage is due to the foliose lichens, the possibility of using weed-killers against them is very promising. Fernoxone has proved to be the least phytotoxic, cheap and quite effective against the lichens causing damage to the temperate fruits of Kumaon.

Acknowledgment

The authors are greatly indebted to Dr. P. R. Mehta, Deputy Director, Directorate of Plant Protection, Quarantine and Storage, New Delhi, for suggesting the problem and his keen interest and guidance during the progress of this work.

PROGRESS OF PLANT PROTECTION WORK DONE IN MADRAS STATE DURING THE QUARTER ENDING SEPTEMBER, 1952*.

I. Control of Insect Pests

More than 40,950 acres of paddy crop were treated against various insect pests and rats in the State of Madras during the penultimate quarter of 1952. As a result of timely action against these pests a net saving of more than 3,387 tons of paddy has been estimated. Nearly 27,500 acres of the crop were treated against field rats alone by baiting with zinc phosphide and no less than 1,116 tons of the crop would have been lost but for these operations. The chief insect pests causing heavy damage to crop and against which control operations were conducted were swarming caterpillar of paddy (*Spodoptera mauritia*) and rice grass hopper (*Hieroglyphus banian*) which were checked by dusting respectively, with 5 per cent BHC and 10 per cent BHC in 1,300 acres and 2,200 acres, and paddy jassid (*Nephotettix bipunctatus*) which was controlled over 1,173 acres. The savings effected were respectively 300 tons, 273 tons, and 180 tons of paddy in these cases. BHC 10 per cent was dusted against rice bug (*Leptocorisa acuta*), rice hispa (*Hispa armigera*), rice leaf roller (*Cnaphalocrosis medinalis*), rice thrips (*Thrips oryzae*) and rice fulgorid (*Nilaparvata sordescens*) over a total area of 1,600 acres as a result of which a loss of 140 tons was averted. Chief amongst the miscellaneous pests treated were the rice mealy bug (*Ripersia oryzae*), the blue beetle (*Leptispa pygmaea*) and paddy snails.

Amongst the millets, sorghum, *ragi* and *cumbu* were damaged by various pests. The sorghum pests *viz.* ear head bug (*Calocoris angustatus*) sorghum mite (*Paratetranychus indicus*) in 425 acres and 112 acres respectively, were controlled by dusting with 10 per cent BHC or sulphur, which resulted in a gain of about 60 tons of the grain. 153 acres more of the sorghum crop were treated against other pests such as stem borer (*Chilo* sp.) and red hairy caterpillar (*Amsacta albistriga*). Thus an extra 18 tons of the grain were saved from destruction.

45 tons of *'ragi'* were saved by treating the crop with 10 per cent BHC dust or BHC suspension against ragi flea beetle (*Chaetocnema* sp.) cut worm (*Laphygma exigua*), ragi borer (*Sesamia inferens*) and ragi root aphid (*Tetraneura hirsuta*) damaging crop in 456 acres. In all an extra yield of about 69 tons was estimated by treating the crop over 733 acres.

Use of suitable insecticides on *cumbu crop* to control pests such as grasshoppers, the earhead beetles over an area of 833 acres brought about a saving of more than 7 tons.

About 2,635 acres of brinjal were treated against various pests and on account of insecticidal measures (such as spraying and dusting of arsenates, spraying 0.1 per cent DDT, application of tobacco decoction or BHC in suspensions etc.). Nearly 249 tons of crops were estimated

*Abstract from the quarterly report of the Govt. Entomologist and Mycologist, Madras, of the plant protection work done during the quarter ending 30th September 1952.

to have been saved. The pests concerned were the lady bird beetle (*Epilachna* sp.), the lace wing bug (*Urentius echinus*), aphids, jassids and others such as mites, mealy bugs and thrips.

Cutworms and Chafer beetles attacking 256 acres of potato and aphid and cutworms attacking 319 acres of cabbage were controlled by dusting 5 per cent DDT or BHC in case of potatoes, and with other suitable insecticides in case of cabbage, as a result of which 25 tons of potatoes and 31 tons of cabbage were saved.

Dusting with BHC dust or spraying with wettable BHC over 1,306 acres of onion crop infested with pests such as onion thrips (*Thrips tabaci*), cutworms and hairy caterpillars gave an extra yield of about 130 tons of the produce.

Chillie crop was severely infested with chillie thrips (*Scirto-thrips dorsalis*) in 7,608 acres and with other pests over 41 acres. Treatments such as dusting with BHC brought in an additional saving of 1,525 tons of crop.

Also, treating miscellaneous vegetables over an aggregate area of 437 acres infested with various pests such as jassids, red pumpkin beetle (*Aulacophora foveicollis*) and mites, averted a loss of 48 tons of chillies.

Amongst the oilseed crops groundnut was treated over a total area of 431 acres, out of which 287 acres were treated with 10 per cent BHC against the red hairy caterpillar (*Amsacta albistriga*) and the remaining area against the groundnut ' sarul ' ' (*Stomopteryx nertaria*). Controlling *Amsacta* alone gave an extra yield of 28 tons. Other oil-seed pests noted were caterpillars on gingelly, ' verupuchi ' (*Sphenoptera perotetti*) on groundnut and semi looper (*Achaea janata*) on castor, over a total area of 64 acres.

Spraying with BHC in suspension was carried out over 85 acres of sugarcane crop infested with sugarcane borer (*Argyria sticticraspis*).

Cotton pests were controlled in 289 acres by the use of mixture of DDT, BHC and sulphur.

Black headed caterpillar (*Nephantis serinopa*) of coconut was controlled in about 5,200 coconut trees by cutting and burning away the attacked parts.

Rats and other rodents causing heavy damage in various field crops were controlled by systematic baiting with zinc phosphide in 540 acres of potatoes, 50 acres of vegetables, 390 acres of tapioca and about 1,000 coconut seedlings. The produce thus saved was estimated at 38 tons.

Fruit pests viz. citrus leaf miner (*Phyllocnistis citrella*), lemon caterpillar (*Papilio demoleus*), red tree ant (*Oecophylla smaragdina*) and mealy bugs, were checked by adopting suitable control measures in 13,843 citrus trees and 1,082 other fruit trees. This resulted in a gain of about 15,000 rupees. Flea beetles on grape vine were effectively controlled by spraying BHC suspension in 88 acres of grape vine.

II. Control of Plant diseases

In 22 districts of the State, paddy seed sufficient to sow over 50,389 acres, was treated with Agrosan GN, as a protective measure against ' foot-rot ', ' helminthosporiose ' and other seed-borne diseases. Besides, in 13 districts, about 151 acres of paddy nursery were sprayed with Bordeaux mixture (1 per cent) or Perenox (1 lb. in 20 gallons) against the ' blast ' disease. In addition, over 37.5 acres of paddy crop were treated with Fernoxone against algal and other weeds, and 3 acres of crop against the ' sterility ' disease.

In 14 districts, *jowar seed* sufficient to sow about 80,749 acres was dressed with sulphur (1 oz. per 15 lbs. of seed) as a preventive measure against ' smuts '. Besides, in the Anantapur and Bellary districts, Italian millet seed, to sow over 7,156 acres, was similarly treated against ' smut '. Besides, about 198 acres of *ragi*, spread over 8 districts, were sprayed with Bordeaux mixture (1 per cent) or Perenox (1 lb. in 20 gallons) against the ' blast ' disease. Eradication of infected plants was carried out over an area of 53 acres of *bajra* crop against the ' green-ear ' disease.

Chilli crop covering an area of over 494.52 acres, and spread over 11 districts, was sprayed with Perenox (1 lb. in 20 gallons) or Bordeaux mixture (1 per cent) against the ' fruit-rot ' and ' damping-off ' diseases. In addition, in the Krishna district, virus affected Chilli plants were eradicated over an area of 10 acres. In Vishakapatnam, Cuddapah, Kurnool, Bellary, South Arcot and Ramanathapuram districts, 80.20 acres of onion crop were sprayed with Perenox (1 lb. in 40 gallons), against ' leaf-blight '. In West Godavari, Guntur, Cuddapah, Kurnool and Coimbatore districts, 36 acres of turmeric crop were sprayed with Bordeaux mixture or Perenox against 'leaf-spot' disease. Brinjals affected with ' little-leaf ' (virus) were rogued out of 111.13 acres of the crop in Srikakulam, Vishakapatnam, East and West Godavari, Krishna, Guntur and Bellary districts. In Anantapur, Bellary, North Arcot, Madurai and Ramanathapuram districts, tomato crop covering an area of 43.07 acres, was treated against ' leaf-blight ', ' fruit-rot ' and ' powdery mildew ' diseases. In the Nilgiri district, 3.25 acres of potato crop were sprayed with Bordeaux mixture against ' early-blight '. Besides, 22.10 acres of several vegetable crops were sprayed with Perenox (1 lb. in 40 gallons) against ' leaf-spot ', ' damping-off ' and other diseases.

Citrus trees distributed over 22 districts of the State were treated as follows :—18,738 trees against ' foliocellosis ', 15,609 trees against ' gummosis ', 18,950 trees against ' die-back ' and ' twig-blight ', 2,340 trees against ' canker ', and 1,420 trees against various nutritional

deficiencies. About 101 acres of grapevines in Chingleput, Tiruchi, Madurai, Ramanathapuram, Tinnevelly and Coimbatore districts, were treated against ' powdery ' and ' downy ' mildews. In the Tirunelveli district, ' Panama wilt ' affected banana plants were eradicated over an area of 45 acres. Besides, 162 other fruit trees were treated against ' leaf-spot ', ' die-back ', etc.

Eradication of smutted shoots and ' striga ' weed, was carried out over an area of 46 acres of sugarcane crop. Over 224 acres of tobacco in Srikakulam, Vishakapatnam, East and West Godavari, Guntur, Kurnool and Coimbatore districts, were sprayed with Bordeaux mixture or Perenox against the ' damping-off ' disease. About 30 acres of cotton crop were dusted with sulphur against 'mildew'.

Over 4,615 coconut trees in the East Godavari, Anantapur, Salem, Tanjore, Tiruchirapalli, Pattukottai, North and South Malabar districts, were treated against ' bud-rot ' and ' stem-bleeding ' diseases. Besides, 519 arecanut palms in North and South Malabar and South Kanara districts, were sprayed with Bordeaux mixture against the ' Mahali ' disease.

NOTES AND NEWS

A new Antidote against Parathion and other phosphatic Insecticides*

Buscopan is the newly discovered antidote to Parathion and some other nerve-gas types of insecticides like dimethyl Parathion and Systox and may be to the nerve gases themselves. In treatment of laboratory animals poisoned by Parathion it is much more effective than atropine. Chemically it is 1N-butyl-scopolammonium bromide. Buscopan is more effective when given with oxygen and glucose than when given alone.

A new Emulsifier for reducing Danger of Nerve Gas type Chemicals such as phosphatic Insecticides†

The Nerve-gas type insecticides, such as Parathion and probably the nerve gases too, can have their dangerous skin penetrating power reduced by more than 100 times through a new kind of emulsifier according to results of tests made by Drs. William B. Deichmann, Patricia Brown and Charles Dawning of Albany Medical College, Albany, N. Y.

The emulsifier tested by the Albany scientists is known only as Emulsifier 42-1A. Chemically it is an aromatic polyglycol ether obtained when Ethylene oxide is added to a phenol of high molecular weight. The insecticide does not lose its poisonous property for insects as a result of the emulsifier's action. This emulsifier is made by the Chemogro Corporation of New York. Dr. Deichmann used it with a new insecticide, also made by Chemogro, called Systox which is a systemic organic phosphate insecticide of the so-called nerve-gas class.

The emulsifier and insecticide are mixed and shipped in a concentrated form. It is in this form that the insecticide's ability to penetrate skin and thus cause poisoning is reduced 100 times. But when the emulsifier-insecticide mixture is diluted with water as the farmer will do when he uses it, the original toxicity of the insecticide is restored.

The emulsifier's protective action is on skin penetration. It is much less effective in case the insecticide is swallowed.

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*Extract from *Science News Letter*, 62, (11), p. 172, 1952.

†Extract from *Science News Letter*, 62, (11), p. 168, 1952.

Use of Aldrin as a Ground Bait for Locust*

Successful trials of Aldrin as a ground bait for locust, are reported from Pakistan. As little as 1½ ounces of Aldrin to 100 lbs. of bait are claimed to have given excellent results at less cost than other available methods.

Free-flowing Pentachlorophenol†

A free-flowing Pentachlorophenol which is said to be less dusty, having less odour and faster dissolving than the ordinary pentachlorophenol flakes is now available in commercial quantities from Monsanto Chemical Company, U. S. A. This material is in the form of irregularly shaped pellets ranging downward in size from one-eighth inch. It is produced by treating the regular Pentachlorophenol flakes with a specially selected oil and is very useful in termite control.

Use of Chemotherapeutants for control of Plant Diseases‡

Chemotherapeutants (unlike conventional sprays put on the outside of plants) are compounds which are watered on the soil and taken to the interior portions of the plant where they give protection against disease. A Connecticut Experiment Station scientist has found that many of the more effective chemotherapeutants injured the roots of the plants which they protected. Further, he found that such root injury altered the metabolism of the plants and produced pronounced changes in their soluble sugar contents. Two experiments carried out by the Station furnish further proof of this theory. In the first case, it was found that a new experimental compound, No. 1182, made tobacco plants more resistant to the tobacco mosaic virus, concurrently altering the plants' water soluble nitrogen content and, hence, their metabolism. Tobacco plants given

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*Extract from *The Chemical Age,* Vol. LXVII, No. 1739, November, 1952, p. 646.

†Extract from *Chemical and Engineering News,* Vol. 30, No. 42, October 20, 1952, p. 4424.

‡Extract from "*Seed World*" Oct. 17, 1952.

10 daily soil applications of 1182 and then inoculated with mosaic virus were much more resistant to the disease than " control " plants which received no treatment with the chemical but were inoculated with the virus. The number of mosaic lesions on leaves of the 1182-treated plants was only about one-third of the number of the control plants. However, when the mosaic virus was put in culture solution and then subjected to 1182, it was not inactivated at all, which is pretty good proof that the effect of the chemical is not on the virus but on the tobacco plant—that in some way, it changes the plants' metabolism and makes it resist the disease.

Organic Miticide K-101*

Kolka Chemical Works in U. S. A. is now producing p-chlorophenyl p-chlorobenzene sulfonate in commercial quantities. It can be formulated in dusts or sprays. According to the manufacturer, tests have been conducted which show that this material will control a wide variety of mites. K-101 is said to be compatible with many insecticides and fungicides and can be co-sprayed where required. It has several weeks of residual effectiveness and can be applied under most weather conditions.

Control of Orobanche on Tobacco†

Orobanche is a plant parasite which is known to cause considerable damage every year to crops like tobacco, tomato and brinjal. The Kaira district of Gujerat where tobacco is grown for the manufacture of ' bidis ' is particularly affected by this parasite. Normally, the only control consists in pulling out orobanche plants mechanically before seed formation. " Crag " Herbicide I (2, 4—dichlorophenoxyethyl sulphate) has been tested for control of this parasite and preliminary experiments reveal that the herbicide has a selective action on orobanche without affecting tobacco plants in any way. A spray of " Crag " Herbicide I controls germination of orobanche seeds and where orobanche has sprouted, the herbicide kills the plants just emerging from the soil.

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*Extract from *Chemical and Engineering News,* September 19, 1952, pp. 4082-83.

†Extract from General Bulletin. 25 dated December 2, 1952, issued by National Carbon Company (India) Limited, Calcutta 1.

New Fungicide stimulates Root Growth*

Dr. Michael Szkolnik has been conducting experiments with a new fungicide which shows stimulating effects used as a root-dip for transplants at New York State's Experiment Station at Geneva. First observed in disease control studies with the quinine tree, the two chemicals, Orthocide and Dithane Z-78, are now used on tomato plants. It is believed that an intermediate product is formed as a break-down of these chemicals. These products apparently induce development of a greater root mass which in turn stimulates greater top growth.

Rabbit Repellents†

Netting for the protection of fruit trees against rabbits is expensive and not infallible, nor is damage limited to young trees. Valuable 10 or 20 year-old mature trees can be ring-barked in one night. An organo-zinc complex ZDC (Zinc dimethyldithiocarbamate-cyclohexylamine complex) used as deer repellent and claimed to be an effective rabbit repellent, has proved useless. By far the best results were secured from a resin, roughly a 1 : 1 by weight mixture of commercial colophony and ethyl alcohol. The next most satisfactory repellent was bone oil.

Systemic Fungicides‡

Much of the recent work on the control of plant diseases by chemotherapy (*i.e.* by introducing curative chemicals into the plant) has been done on systemic diseases. Promising results have been obtained in case of the Dutch Elm disease, *Fusarium* wilt of carnation, *Verticillium* wilt of maple, and the *Fusarium* wilt of tomatoes. Inorganic salts, sulphonamide derivatives, hydro-quinones, benzoic acids, phenols, 8-quinolinol benzoates, azo derivatives and antibiotics have been used.

The 4-nitrosopyrazole tried by McNew and Sundholm proved effective in reducing the incidence of *Alternaria solani* on tomato. The Aryloxy alkyl carboxylic acids tested in England by Croudy and Wain gave significant protection to young bean seedlings against *Botrytis cinerea* or *B. fabae.*

Of the antibiotics used as a systemic fungicide mention is made of 'griseofulvin' which is produced in culture by *Penicillium nigricans* and was used by Brian and his colleagues.

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*Extract from *Farm Chemicals,* Vol. 115, No. 10, p. 67, 1952.

†Extract from *Manufacturing Chemist,* Vol. XXIII, n. 9, pp. 379-80 (1952).

‡Abstract from "Introduction to Systemic Fungicides" by R. L. Wain. *Proceedings of the Association of Applied Biologists,* Vol. 39 (3) 429-432, 1952.

In some cases the extracts of plants have also been tried successfully for antibacterial and antifungal activity. Buchner et al found that the leaves, stems and roots of the sweet-potato contain substances which inhibit the growth of two species of wilt fungi as well as certain bacteria. In some cases the active constituents have been isolated in a crystalline form, viz. the tomatin from the tomato plant, which is an alkaloidal glycoside and possesses fungistatic activity towards the *Fusarium* spp. causing wilt in tomatoes, peas and cabbage.

The Effects of 'Hormone' Herbicides upon Cereal Crops*

' Hormone ' herbicides may sometimes cause rather serious damage to cereal crops. The most obvious phytocidal effect may be the production of morphological abnormalities in the vegetative parts and in the inflorescence. Other adverse effects may be on the yield and the quality of grain, on uniform ripening and the like.

Spraying before tillering or immediately before the emergence of the ear should therefore be avoided. Moreover, unless it is absolutely necessary, these herbicides should not be applied at rates higher than 1 lb. acid equivalent per acre. Methoxone is found to be less dangerous than the amine or ester forms of 2, 4-D. Sodium 2, 4-D appears to be relatively harmless ; but it is not suitable for low volume spraying because of its low solubility.

Warfarin, the new Rodenticide†

Warfarin is an officially coined name of the chemical 3-(alpha-acetonyl-benzyl-4-hydroxy-coumarin). This chemical was developed by Dr. Karl Paul Link of the Wisconsin University and was released for general distribution in June 1950.

It is an anti-coagulant and must be ingested by rats and mice in a very large single dose or in very small doses each day for at least five days before haemorrhages become fatal and a painless death of the animal takes place.

Its advantage over other strong poisons lies in the fact that its use in very low concentration makes it much safer against accidental ingestion by human beings, poultry and other stock and does not give rise to unpalatability in the food bait thus dispensing with the need of prebaiting and change of poisons or bait bases.

It is used at a concentration of 0.025 per cent by weight in corn or oatmeal or other approved material. The baits should remain in position for a number of days without disturbance and have to be laid in suitable containers to prevent scatter and loss. Where these conditions are observed it is established that warfarin is equally effective as the other rodenticides which are strong poisons.

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*Abstract from "Effects of 'Hormone' herbicides upon cereal crops", by E. B. Scragv, *Proceedings of the Association of Applied Biologists,* Vol. 39 (3), 423-428, 1952.

†Note prepared in the Directorate of Plant Protection, Quarantine and Storage.

Hormone Method of Eradicating plantain trees*

A new method of eradicating uneconomical plantain trees was reported from New South Wales. The treatment consisted of injecting into the pseudostem of the plant a small quantity of 1 per cent solution of weed-killing hormone of the 2,4-D complex.

From the point of view of examining the feasibility of applying this method in the eradication of plantain trees affected with the ' bunchy-top ' disease, certain trials were undertaken using Fernoxone as the weedicide.

Various methods of applying the hormone were tried, but the one most effective was that of injection. Varying concentrations were also tried and the most promising results were obtained with 1 per cent and 2½ per cent solutions as follows :—

	1% concentration	2½% concentration
No. of plants injected . .	69	102
No.of dead 1 month after injection	67	97
No. of survivors and regrowths 3 months after injection. These were again injected	32	15
No. of regrowths after 1 month of 2nd injection	3	1

(1) The injection of plants gave a high degree of kill ; 97.2 per cent with 1 per cent solution and 95 per cent with 2½ per cent solution.

(2) Considerable regrowths however occurred from the rhizome but these were fewer in the treatment with the higher concentration.

(3) Two injections at least are necessary to sufficiently inactivate the rhizomes.

Further investigations are being continued.

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*Extract from the Administration Report of the Director of Agriculture, Ceylon, for 1951, page 56, September, 1952,

Occurrence of *Phoma chrysanthemicola* Hollos on imported Chrysanthemum Seedlings*

Several varieties of chrysanthemum seedlings, recently imported by the Empress Botanical Gardens, Poona, from Holland, were found to be infected with *Phoma* sp., possibly *Phoma chrysanthemicola* Hollos. The diseased plants were kept under observation at the Plant Quarantine Laboratory, Poona. Several varieties succumbed to the disease after a few days. Had these been released without any check, they might have proved to be a source of infection to other plants. Post entry quarantine is therefore of great necessity in such cases.

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*Note prepared in the Directorate of Plant Protection, Quarantine and Storage.

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